UK wildlife calendar reshuffled by climate change

29 June 2016 - Climate change is already affecting the UK's wildlife calendar, and it's likely this will continue into the future, according to new research published in the journal Nature.

The results suggest that seasonal events - such as the timing of flowering in plants and bird breeding behaviour - are generally more sensitive to temperature change, than to changes in precipitation, such as rain and snow. Plants and animals respond differently to temperature changes at different times of year.

Seasonal relationships between predators, such as insect-eating birds, and plankton-eating fish, and their prey could be disrupted in future. This could affect the breeding success and survival of these species, with possible consequences for UK biodiversity.

The analysis shows that, given these patterns in climate sensitivity, species in the middle of food webs, such as some insect and plankton species - which feed on plants but are themselves fed on by predators - are likely to change their seasonal behaviour the most in future.

The study was led by ecologists at the UK's Centre for Ecology & Hydrology , working in collaboration with 17 other organisations including the Met Office. The analysis involved more than 370,000 observations of seasonal events including long-term records, spanning 1960 to 2012, covering 812 UK marine, freshwater and dry-land plant and animal species. The variety of species ranges from plankton to plants, butterflies to birds and moths to mammals.

The data represented three levels of the food chain: primary producers (such as flowering plants and algae); primary consumers (such as seed-eating birds and herbivorous insects); and secondary consumers (such as insect-eating birds, and predatory fish and mammals).

Species records were combined with national temperature and rainfall data to show that plants and animals not only vary greatly in their sensitivity to climate change, but that species at different levels in food chains have been responding to climate in different ways. Using the current best estimates of climate change, the study forecasts that by 2050 those species categorised as primary consumers will have shifted their seasonal timing by more than twice as much as species at other trophic levels - an average of 6.2 days earlier versus 2.5-2.9 days - although there is substantial variation among different groups of species.

The lead author of the study, Dr Stephen Thackeray from the Centre for Ecology & Hydrology, said: "This is the largest study of the climatic sensitivity of UK plant and animal seasonal behaviour to date. Our results show the potential for climate change to disrupt the relationships between plants and animals, and now it is crucially important that we try to understand the consequences of these changes."

Dr Thackeray added: "Our findings highlight the importance of managing ecosystems within a 'safe operating space' with respect to the likely impacts of projected climate change."

The study combined data collected as part of long-running scientific-monitoring schemes, and also extensive citizen science initiatives, capitalising on the rich tradition of biological recording in the UK.

Co-author Dr Deborah Hemming, Met Office scientific manager, said: "We are lucky in the UK to have a long history of people fascinated with observing and recording events in nature. By quantifying the relationships between these phenological records and climate data across the UK, we identify many phenological events that are extremely sensitive to climate variations. These provide ideal early indicators, or sentinels, for monitoring and responding to the impacts of climate variability and change on nature."

Co-author Sian Atkinson, senior conservation advisor with the Woodland Trust , said: "Volunteers with our Nature's Calendar project contribute thousands of records each year on the timing of seasonal events. The resulting database is an invaluable resource for scientists studying the potential impacts of climate change. This piece of research demonstrates how very valuable such records are in helping us to build a picture of the likely impacts of climate change for our wildlife."

The study was carried out by scientists from the UK's Centre for Ecology & Hydrology, Met Office, Rothamsted Research, The Sir Alister Hardy Foundation for Ocean Science, The British Trust for Ornithology, The Woodland Trust, Butterfly Conservation, University of Cambridge, Sea Mammal Research Unit, The Freshwater Biological Association, University of Lincoln, Aarhus University (Denmark), University of Edinburgh, The Australian National University (Australia), Coventry University, Poznan University of Life Sciences, (Poland), University of Aberdeen, and the People's Trust for Endangered Species.

The work was funded by the UK Natural Environment Research Council .

Images provided by The British Trust for Ornithology .

Last updated: 30 June 2016